

This listing of claims will replace all prior versions,
and listings, of claims in the application:

1 Claim 1 (original): For use in a system including a light
2 source, and a light detector, for measuring one or more of
3 at least two target substances, each of the at least two
4 target substances including a chain of nucleotides, a
5 sensor comprising:

6 a) at least one optical carrier;

7 b) at least two optical cavities, each of the at
8 least two optical cavities

9 1) being optically coupled with the optical
10 carrier, and

11 2) having a surface including oligonucleotides
12 complementary to a particular one of the at least
13 two target substances,

14 wherein, when light is applied to the optical
15 carrier, a resonance within each of the optical cavities is
16 excited,

17 wherein, if a target substance hybridizes with
18 oligonucleotides on the surface of an optical cavity, a
19 shift in the resonance of that optical cavity occurs, and
20 wherein a measurement of the target substance can
21 be determined based on the shift in resonance.

1 Claim 2 (original): The sensor of claim 1 wherein the
2 optical carrier is an optical fiber.

1 Claim 3 (original): The sensor of claim 1 wherein at least
2 one of the optical cavities is a microsphere.

1 Claim 4 (original): The sensor of claim 1 wherein at least

2 one of the optical cavities is a toroidal microcavity.

1 Claim 5 (original): The sensor of claim 1 wherein at least
2 one of the optical cavities is a InP microdisk.

1 Claim 6 (currently amended): The sensor of claim 1 wherein
2 at least one of the target substances is DNA.

1 Claim 7 (currently amended): The sensor of claim 1 wherein
2 at least one of the target substances is RNA.

1 Claim 8 (original): The sensor of claim 1 wherein, if a
2 target substance hybridizes with oligonucleotides on the
3 surface of an optical cavity surface, a shift in the
4 resonance of that optical cavity of a first amount occurs,
5 and
6 wherein if a substance which differs from the target
7 substance by a single nucleotide is made available for
8 hybridization with the surface of the optical cavity
9 surface, a shift in the resonance of the optical cavity of
10 a second amount occurs, wherein the first amount is
11 detectably greater than the second amount.

1 Claim 9 (original): The sensor of claim 8 wherein the
2 first amount is at least ten times greater than the second
3 amount.

1 Claim 10 (original): The sensor of claim 1 wherein the
2 oligonucleotides provided on at least one of the optical
3 cavities are 11-mer oligonucleotides.

1 Claim 11 (original): The sensor of claim 1 wherein the

2 oligonucleotides provided on at least one of the optical
3 cavities are at least 27-mer oligonucleotides.

1 Claim 12 (original): The sensor of claim 1 wherein the
2 oligonucleotides provided on at least one of the optical
3 cavities are at least 11-mer oligonucleotides.

1 Claim 13 (original): The sensor of claim 1 wherein the
2 oligonucleotides provided on at least one of the optical
3 cavities are at most 27-mer oligonucleotides.

1 Claim 14 (original): A system for measuring one or more of
2 at least two target substances, each of the at least two
3 target substances including a chain of nucleotides, the
4 system comprising:

- 5 a) a light source;
 - 6 b) a light detector;
 - 7 c) a sensor, the sensor including:
 - 8 1) at least one optical carrier optically
9 coupled with both the light source and the light
10 detector;
 - 11 2) at least two optical cavities, each of the at
12 least two optical cavities
 - 13 A) being optically coupled with the optical
14 carrier, and
 - 15 B) having a surface including
16 oligonucleotides complementary to a
17 particular one of the at least two target
18 substances,
- 19 wherein, when the light source applies
20 light to the optical carrier, a resonance within
21 each of the optical cavities, having a first

22 characteristic, is excited and is detected by the
23 detector, and
24 wherein, if a target substance
25 hybridizes with oligonucleotides on the surface
26 of an optical cavity, a change in the
27 characteristic of the resonance of that optical
28 cavity occurs and is detected by the detector;
29 and
30 d) a processor for determining a measurement of the
31 target substance using a shift in the characteristic
32 of the resonances detected by the detector.

1 Claim 15 (original): The system of claim 14 wherein the
2 optical carrier is an optical fiber.

1 Claim 16 (original): The system of claim 14 wherein at
2 least one of the optical cavities is a microsphere.

1 Claim 17 (original): The system of claim 14 wherein at
2 least one of the optical cavities is a toroidal
3 microcavity.

1 Claim 18 (original): The system of claim 14 wherein at
2 least one of the optical cavities is a InP microdisk.

1 Claim 19 (currently amended): The system of claim 14
2 wherein at least one of the target substances is DNA.

1 Claim 20 (currently amended): The system of claim 14
2 wherein at least one of the target substances is RNA.

1 Claim 21 (original): The system of claim 14 wherein, if a

2 target substance hybridizes with oligonucleotides on the
3 surface of an optical cavity surface, a shift in the
4 resonance of that optical cavity of a first amount occurs,
5 and

6 wherein if a substance which differs from the target
7 substance by a single nucleotide is made available for
8 hybridization with the surface of the optical cavity
9 surface, a shift in the resonance of the optical cavity of
10 a second amount occurs, wherein the first amount is
11 detectably greater than the second amount.

1 Claim 22 (original): The system of claim 21 wherein the
2 first amount is at least ten times greater than the second
3 amount.

1 Claim 23 (original): The system of claim 14 wherein the
2 oligonucleotides provided on at least one of the optical
3 cavities are 11-mer oligonucleotides.

1 Claim 24 (original): The system of claim 14 wherein the
2 oligonucleotides provided on at least one of the optical
3 cavities are at least 27-mer oligonucleotides.

1 Claim 25 (original): The system of claim 14 wherein the
2 oligonucleotides provided on at least one of the optical
3 cavities are at least 11-mer oligonucleotides.

1 Claim 26 (original): The system of claim 14 wherein the
2 oligonucleotides provided on at least one of the optical
3 cavities are at most 27-mer oligonucleotides.

1 Claim 27 (original): The system of claim 14 wherein the

2 processor determines the measurement of the target
3 substance using a shift in characteristic of the resonances
4 detected by the detector, and refractive indices of the
5 optical cavity and a solution in which the target substance
6 is allowed to come into contact with the optical cavity.

1 Claim 28 (original): The system of claim 27 wherein the
2 processor determines the measurement of the target
3 substance further using an excess polarizability of a
4 volume of the target over an equal volume of a solution in
5 which the target is provided.

1 Claim 29 (original): The system of claim 14, wherein the
2 optical cavity is a microsphere, and
3 wherein the processor determines the measurement of
4 the target substance using a shift in characteristic of the
5 resonances detected by the detector, and a radius of the
6 microsphere.

1 Claim 30 (original): The system of claim 14 wherein the
2 measurement of the target substance is a surface density of
3 the target substance bound to the optical cavity.

1 Claim 31 (original): The system of claim 14 wherein the at
2 least one optical carrier includes a plurality of optical
3 fibers.

1 Claim 32 (original): The system of claim 31 wherein each
2 of the plurality of optical fibers is optically coupled
3 with at least two of the optical cavities.

1 Claim 33 (original): The system of claim 31 further

2 comprising at least one additional light detector,
3 wherein at least two of the plurality of optical fibers
4 are optically coupled with a common light source, but with
5 different light detectors.

Claims 34-39 (canceled)